UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/539,691	03/31/2000	Takahiro Yamamoto	P/1071-1009	1017

2352 7590 10/02/2002

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK, NY 100368403

EXAMINER
STAICOVICI, STEFAN

ART UNIT	PAPER NUMBER
1732	15

DATE MAILED: 10/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/539,691	YAMAMOTO ET AL.	
	Examiner	Art Unit	
	Stefan Staicovici	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 15-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 15-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *10, 13* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. Applicants' amendment filed June 6, 2002 has been entered. Claim 8 has been amended. No claims have been canceled. No new claims have been added. Claims 1-10 and 15-18 are pending in the instant application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claim 18 is rejected under 35 U.S.C. 102(b) as being anticipated by MacDonald *et al.* (US Patent No. 5,362,940) or JP 10-34365.

MacDonald *et al.* ('940) teach the claimed process of machining a plurality of holes in a component (12) (col. 3, line 30) including, providing a laser (2), passing a laser beam (3) through a diffraction grating (8) to form a plurality of beams (see Figure 1) and irradiating the plurality of beams onto said component (12) to simultaneously process said plurality of holes (col. 6, lines 27-30) at a variety of locations.

JP 10-34365 teaches the claimed process of simultaneously forming a plurality of holes in a plate using a phase grating (9) (diffraction grating) including, providing a laser beam and dividing said beam into a plurality of beams using said phase grating (9) (diffraction grating).

4. Claims 1-4, 9-10, 15 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Yamamoto *et al.* (US Patent No. 6,172,330 B1).

Regarding claims 1, 15 and 18, Yamamoto *et al.* ('330) teach the claimed process of machining a plurality of holes in a green ceramic component (10) including, providing a laser (2), passing a laser beam (L) through a diffraction grating (15) to form a plurality of beams and irradiating the plurality of beams onto said component (12) to simultaneously process said plurality of holes (col. 4, line 64 through col. 5, line 13). Further, Yamamoto *et al.* ('330) teach a uniform size and shape for all holes (col. 6, line 64 through col. 7, line 6). Since diffraction occurs when a light wave (laser beam) passes through an aperture (hole), it is submitted that a plate with holes (mask) forms a diffraction grating system.

In regard to claims 2-3, Yamamoto *et al.* ('330) teach moving the ceramic green sheet (10) in order to move the beam spot from one irradiation region to another (col. 5, lines 50-65).

Specifically regarding claims 4 and 9, Yamamoto *et al.* ('330) teach a pulsed CO_2 laser system (col. 4, line 61 and col. 5, line 44).

Regarding claim 10, Yamamoto *et al.* ('330) teach a resin carrier film (12) (col. 4, line 68 through col. 5, line 1).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 4, 8 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald *et al.* (US Patent No. 5,362, 940) in view of Anderson (US Patent No. 3,770,529), Sounders (US Patent. 3,742,182) or Yamamoto *et al.* (US Patent No. 6,172,330 B1).

MacDonald *et al.* ('940) teach the basic claimed process of machining a plurality of holes in a ceramic circuit component (12) (col. 2, lines 50-52 and col. 3, line 30) including, providing a laser (2), passing a laser beam (3) through a diffraction grating (8) to form a plurality of beams (see Figure 1) and irradiating the plurality of beams onto said component (12) to simultaneously process said plurality of holes (col. 6, lines 27-30) at a variety of locations. Further, it should be noted that since the invention of MacDonald *et al.* ('940) teaches a method of reducing laser

intensity non-uniformities (col. 2, lines 53-55), it is submitted that the resulting holes have a uniform size and shape.

Regarding claims 1 and 15-16, although MacDonald *et al.* ('940) teach a ceramic (alumina) component, MacDonald *et al.* ('940) do not teach laser machining a "green" ceramic sheet. Anderson ('529) (col. 3, line 62 through col. 4, line 27), Saunders ('182) (see Abstract) and Yamamoto *et al.* ('330) (see Abstract) teach laser machining a green ceramic sheet. Therefore, it would have been obvious for one of ordinary skill in the art to have provided a green ceramic sheet as taught by Anderson ('529), Saunders ('182) or Yamamoto *et al.* ('330) in the process of MacDonald *et al.* ('940) because, Anderson ('529), Saunders ('182) or Yamamoto *et al.* ('330) specifically teach laser machining of a "green" ceramic sheet for electronic circuit boards as used in the process of MacDonald *et al.* ('940).

In regard to claim 4, MacDonald *et al.* ('940) teach a pulsed laser (col. 2, lines 45-49).

Specifically regarding claim 8, MacDonald *et al.* ('940) teach that diffraction grating is made of quartz (col. 4, lines 38-50). It is submitted that quartz has a high transmittance to laser light.

Specifically regarding claim 16, MacDonald *et al.* ('940) teach forming holes having a diameter of 12.5 microns (col. 4, lines 65-68).

7. Claims 2-3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald *et al.* (US Patent No. 5,362, 940) in view of Yamamoto *et al.* (US Patent No. 6,172,330 B1).

Regarding claims 2 and 3, MacDonald *et al.* ('940) do not teach moving the ceramic green sheet. Yamamoto *et al.* ('330) teach moving the ceramic green sheet (10) in order to move the beam spot from one irradiation region to another (col. 5, lines 50-65). Therefore, it would have been obvious for one of ordinary skill in the art to have moved the ceramic green sheet as taught by Yamamoto *et al.* ('330) in the process of MacDonald *et al.* ('940) , because Yamamoto *et al.* ('330) specifically teaches that by moving the ceramic green sheet the beam spot moves from one irradiation region to another, hence increasing productivity and reducing production costs.

In regard to claim 10, MacDonald *et al.* ('940) do not teach a carrier film. Yamamoto *et al.* ('330) teach a resin carrier film (12) (col. 4, line 68 through col. 5, line 1). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a resin carrier film as taught by Yamamoto *et al.* ('330) in the process of MacDonald *et al.* ('940) because, Yamamoto *et al.* ('330) specifically teaches that such a resin carrier film is needed as a support for the ceramic green sheet during laser processing (col. 8, lines 40-43).

8. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald *et al.* (US Patent No. 5,362, 940) in view of Yamamoto *et al.* (US Patent No. 6,172,330 B1) and in further view of JP 02-766173 B2.

MacDonald *et al.* ('940) in view Yamamoto *et al.* ('330) teach the basic claimed process as described above.

Regarding claim 17, MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) do not teach a laser machining process that does not drill a hole through the resin carrier film. JP 02-

766173 B2 teaches a process for laser drilling holes in a green ceramic sheet supported on a carrier film including, optimizing the laser pulse width such that the resulting hole does not extend through the carrier film. Therefore, it would have been obvious for one of ordinary skill in the art to have optimized the laser pulse width as taught by JP 02-766173 B2 in the process of MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) , because JP 02-766173 B2 specifically teaches that such a procedure forms holes in a green ceramic sheet without having the hole extending through the carrier film, hence reducing costs, waste by having a reusable carrier film.

9. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto *et al.* (US Patent No. 6,172,330 B1) in view of JP 02-766173 B2.

Yamamoto *et al.* ('330) teach the basic claimed process as described above.

Regarding claim 17, Yamamoto *et al.* ('330) do not teach a laser machining process that does not drill a hole through the resin carrier film. JP 02-766173 B2 teaches a process for laser drilling holes in a green ceramic sheet supported on a carrier film including, optimizing the laser pulse width such that the resulting hole does not extend through the carrier film. Therefore, it would have been obvious for one of ordinary skill in the art to have optimized the laser pulse width as taught by JP 02-766173 B2 in the process of Yamamoto *et al.* ('330) , because JP 02-766173 B2 specifically teaches that such a procedure forms holes in a green ceramic sheet without having the hole extending through the carrier film, hence reducing costs, waste by having a reusable carrier film.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald *et al.* (US Patent No. 5,362, 940) in view of Yamamoto *et al.* (US Patent No. 6,172,330 B1) and in further view of Funami *et al.* (US Patent No. 5,055,653).

MacDonald *et al.* ('940) teach the basic claimed process of machining a plurality of holes in a ceramic circuit component (12) (col. 2, lines 50-52 and col. 3, line 30) including, providing a laser (2), passing a laser beam (3) through a diffraction grating (8) to form a plurality of beams (see Figure 1) and irradiating the plurality of beams onto said component (12) to simultaneously process said plurality of holes (col. 6, lines 27-30) at a variety of locations. Further, it should be noted that since the invention of MacDonald *et al.* ('940) teaches a method of reducing laser intensity non-uniformities (col. 2, lines 53-55), it is submitted that the resulting holes have a uniform size and shape. It should be noted that MacDonald *et al.* ('940) teach the use of reflectors (43) and (44) to scan the laser beam (3) (col. 3, lines 1-15). It is submitted that a galvano-scan mirror is a reflector.

Regarding claim 6, although MacDonald *et al.* ('940) teach a ceramic (alumina) component, MacDonald *et al.* ('940) do not teach laser machining a "green" ceramic sheet. Yamamoto *et al.* ('330) (see Abstract) teach laser machining a green ceramic sheet. Therefore, it would have been obvious for one of ordinary skill in the art to have provided a green ceramic sheet as taught by Yamamoto *et al.* ('330) in the process of MacDonald *et al.* ('940) because, Yamamoto *et al.* ('330) specifically teach laser machining of a "green" ceramic sheet for electronic circuit boards as used in the process of MacDonald *et al.* ('940).

Further regarding claim 6, MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) do not teach converging lenses for individually converging the plural laser beams. Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

11. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald *et al.* (US Patent No. 5,362, 940) in view of Yamamoto *et al.* (US Patent No. 6,172,330 B1) and in further view of Funami *et al.* (US Patent No. 5,055,653) and White, Jr. (US Patent No. 5,367,143).

MacDonald *et al.* ('940) teach the basic claimed process of machining a plurality of holes in a ceramic circuit component (12) (col. 2, lines 50-52 and col. 3, line 30) including, providing a laser (2), passing a laser beam (3) through a diffraction grating (8) to form a plurality of beams (see Figure 1) and irradiating the plurality of beams onto said component (12) to simultaneously process said plurality of holes (col. 6, lines 27-30) at a variety of locations. Further, it should be noted that since the invention of MacDonald *et al.* ('940) teaches a method of reducing laser

intensity non-uniformities (col. 2, lines 53-55), it is submitted that the resulting holes have a uniform size and shape.

Regarding claim 5, although MacDonald *et al.* ('940) teach a ceramic (alumina) component, MacDonald *et al.* ('940) do not teach laser machining a "green" ceramic sheet. Yamamoto *et al.* ('330) (see Abstract) teach laser machining a green ceramic sheet. Therefore, it would have been obvious for one of ordinary skill in the art to have provided a green ceramic sheet as taught by Yamamoto *et al.* ('330) in the process of MacDonald *et al.* ('940) because, Yamamoto *et al.* ('330) specifically teach laser machining of a "green" ceramic sheet for electronic circuit boards as used in the process of MacDonald *et al.* ('940).

Further regarding claim 5, MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) do not teach converging lenses for individually converging the plural laser beams. Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

Further regarding claim 5, MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) and in further view of Funami *et al.*('653) do not teach reflecting a plurality of laser beams.

White, Jr. ('143) teaches a laser process including, providing a laser beam (1), splitting said laser beam into a plurality of beams (4) and reflecting said plurality of laser beams (4) off a mirror onto the part to be machined (see Figure 1 and col. 4, lines 23-34). Since White, Jr. ('143) teaches any reflecting type of mirror (col. 4, lines 30-33), it is submitted that White, Jr. ('143) teaches a galvano-scan mirror. Therefore, it would have been obvious for one of ordinary skill in the art to have reflected the plurality of laser beams off a mirror (galvano-scan mirror) prior to impinging the part to be machined as taught by White, Jr. ('143) in the process of MacDonald *et al.* ('940) in view of Yamamoto *et al.* ('330) and in further view of Funami *et al.*('653), because White, Jr. ('143) specifically teaches that such a procedure allows for a more efficient scanning of the component (col. 3, lines 48-55).

In regard to claim 7, MacDonald *et al.* ('940) do not teach moving the ceramic green sheet. Yamamoto *et al.* ('330) teach moving the ceramic green sheet (10) in order to move the beam spot from one irradiation region to another (col. 5, lines 50-65). Therefore, it would have been obvious for one of ordinary skill in the art to have moved the ceramic green sheet as taught by Yamamoto *et al.* ('330) in the process of MacDonald *et al.* ('940) , because Yamamoto *et al.* ('330) specifically teaches that by moving the ceramic green sheet the beam spot moves from one irradiation region to another, hence increasing productivity and reducing production costs.

12. Claims 1-4, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 10-034365 in view of JP 10-242617.

JP 10-34365 teaches the basic claimed process of forming a plurality of holes in a plate using a phase grating (9) (diffraction grating) including, providing a laser beam and dividing said beam into a plurality of beams using said phase grating (9) (diffraction grating).

Regarding claim 1, JP 10-34365 does not teach a ceramic green sheet. JP 10-242617 teaches laser machining a ceramic green sheet using a laser beam that has been divided into a plurality of beams. Therefore, it would have been obvious for one of ordinary skill in the art to have process a ceramic green sheet as taught by JP 10-242617 using the process of JP 10-34365 because, JP 10-34365 specifically teaches that a phase grating is preferable in dividing a laser beam, and also because both references teach similar processes and solve a similar problem of dividing a laser beam into multiple beams to simultaneously drill a plurality of holes.

In regard to claim 4, JP 10-34365 teaches a pulsed laser beam.

Specifically regarding claim 8, since phase grating (9) divides a laser beam into a plurality of beam, it is submitted that said phase grating has substantial transmittance to said laser beam.

In regard to claims 2 and 3, JP 10-242617 teach moving the ceramic green sheet (10) in order to move the beam spot from one irradiation region to another. Therefore, it would have been obvious for one of ordinary skill in the art to have moved the ceramic green sheet as taught by JP 10-242617 in the process of JP 10-34365, because JP 10-242617 specifically teaches that by moving the ceramic green sheet the beam spot moves from one irradiation region to another, hence increasing productivity and reducing production costs.

Specifically regarding claim 10, JP 10-242617 teach a resin carrier film (12) (col. 4, line 68 through col. 5, line 1). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a resin carrier film as taught by JP 10-242617 in the process of JP 10-34365 because, JP 10-242617 specifically teaches that such a resin carrier film is needed as a support for the ceramic green sheet during laser processing (col. 8, lines 40-43).

13. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 10-034365 in view of JP 10-242617 and in further view of JP 02-766173 B2.

JP 10-34365 in view JP 10-242617 teaches the basic claimed process as described above.

Regarding claim 17, JP 10-34365 in view of JP 10-242617 do not teach a laser machining process that does not drill a hole through the resin carrier film. JP 02-766173 B2 teaches a process for laser drilling holes in a green ceramic sheet supported on a carrier film including, optimizing the laser pulse width such that the resulting hole does not extend through the carrier film. Therefore, it would have been obvious for one of ordinary skill in the art to have optimized the laser pulse width as taught by JP 02-766173 B2 in the process of JP 10-34365 in view of JP 10-242617, because JP 02-766173 B2 specifically teaches that such a procedure forms holes in a green ceramic sheet without having the hole extending through the carrier film, hence reducing costs, waste by having a reusable carrier film.

14. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 10-034365 in view of JP 10-242617 and in further view Funami *et al.* (US Patent No. 5,055,653).

JP 10-34365 teaches the basic claimed process of forming a plurality of holes in a plate using a phase grating (9) (diffraction grating) including, providing a laser beam and dividing said beam into a plurality of beams using said phase grating (9) (diffraction grating).

Regarding claim 6, JP 10-34365 does not teach a ceramic green sheet. JP 10-242617 teaches laser machining a ceramic green sheet using a laser beam that has been divided into a plurality of beams. Therefore, it would have been obvious for one of ordinary skill in the art to have process a ceramic green sheet as taught by JP 10-242617 using the process of JP 10-34365 because, JP 10-34365 specifically teaches that a phase grating is preferable in dividing a laser beam, and also because both references teach similar processes and solve a similar problem of dividing a laser beam into multiple beams to simultaneously drill a plurality of holes. Further regarding claim 6, JP 10-34365 in view JP 10-242617 do not teach converging lenses for individually converging the plural laser beams. Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of JP 10-34365 in view JP 10-242617 because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

15. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 10-034365 in view of JP 10-242617 and in further view Funami *et al.* (US Patent No. 5,055,653) and White, Jr. (US Patent No. 5,367,143).

JP 10-34365 teaches the basic claimed process of forming a plurality of holes in a plate using a phase grating (9) (diffraction grating) including, providing a laser beam and dividing said beam into a plurality of beams using said phase grating (9) (diffraction grating).

Regarding claim 5, JP 10-34365 does not teach a ceramic green sheet. JP 10-242617 teaches laser machining a ceramic green sheet using a laser beam that has been divided into a plurality of beams. Therefore, it would have been obvious for one of ordinary skill in the art to have process a ceramic green sheet as taught by JP 10-242617 using the process of JP 10-34365 because, JP 10-34365 specifically teaches that a phase grating is preferable in dividing a laser beam, and also because both references teach similar processes and solve a similar problem of dividing a laser beam into multiple beams to simultaneously drill a plurality of holes. Further regarding claim 5, JP 10-34365 in view JP 10-242617 do not teach converging lenses for individually converging the plural laser beams. Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of JP 10-34365 in view JP 10-242617 because, Funami *et al.*('653) specifically teaches that such lenses

provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

Further regarding claim 5, JP 10-34365 in view JP 10-242617 and in further view of Funami *et al.*('653) do not teach reflecting a plurality of laser beams. White, Jr. ('143) teaches a laser process including, providing a laser beam (1), splitting said laser beam into a plurality of beams (4) and reflecting said plurality of laser beams (4) off a mirror onto the part to be machined (see Figure 1 and col. 4, lines 23-34). Since White, Jr. ('143) teaches any reflecting type of mirror (col. 4, lines 30-33), it is submitted that White, Jr. ('143) teaches a galvano-scan mirror. Therefore, it would have been obvious for one of ordinary skill in the art to have reflected the plurality of laser beams off a mirror (galvano-scan mirror) prior to impinging the part to be machined as taught by White, Jr. ('143) in the process of JP 10-34365 in view JP 10-242617 and in further view of Funami *et al.*('653), because White, Jr. ('143) specifically teaches that such a procedure allows for a more efficient scanning of the component (col. 3, lines 48-55).

In regard to claim 7, JP 10-242617 teach moving the ceramic green sheet (10) in order to move the beam spot from one irradiation region to another (col. 5, lines 50-65). Therefore, it would have been obvious for one of ordinary skill in the art to have moved the ceramic green sheet as taught by JP 10-242617 in the process of JP 10-34365 in view of Funami *et al.*('653) and in further view of White, Jr. ('143), because JP 10-242617 specifically teaches that by moving the ceramic green sheet the beam spot moves from one irradiation region to another, hence increasing productivity and reducing production costs.

Response to Arguments

16. Applicants' arguments filed June 6, 2002 (Paper No. 12) have been considered.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants' main argument is that the Fresnel Zone Plate array of MacDonald *et al.* ('940) and the mask (15) of Yamamoto *et al.* ('330) are not diffraction gratings. It should be noted that Applicants apply this argument to all the rejected claims.

As defined by Applicant on page 3 of the amendment filed June 6, 2002 (Paper No. 12), a "diffraction grating uses a large number of parallel closely spaced slits which provides a plurality of output light beams." Further, it should be noted that the original disclosure does not define a diffraction grating. As defined on page 9 of the original disclosure, "...feedthrough holes with uniform shape and size can be efficiently formed on a ceramic green sheet by...laser beams uniformly split into plural beams, after allowing the laser beam to pass through a diffraction grating to split a laser beam...into plural laser beams having a uniform shape and size corresponding to the shape and size of the feedthrough holes." Furthermore, the original disclosure does not appear to indicate any effect of the resulting Fraunhoffer diffraction on the resulting claimed process. Hence, it is submitted that the "diffraction grating" constitutes a number of optical elements that provides a plurality of output light beams, that is similar to a Fresnel Zone Plate array (see MacDonald *et al.* ('940)) or a mask with holes (see Yamamoto *et*

al. ('330)). Furthermore, it should be noted that both MacDonald *et al.* ('940) and Yamamoto *et al.* ('330) teach that the plural laser beams have a uniform shape and size that corresponds to the shape and size of the feedthrough holes, hence the ultimate effect of the Fresnel Zone Plate array of MacDonald *et al.* ('940) or a mask with holes of Yamamoto *et al.* ('330) is similar to the "diffraction grating" of the claimed invention, and as such act as a "diffraction grating."

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stefan Staicovici, Ph.D. whose telephone number is (703) 305-

0396. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM and alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jan H. Silbaugh, can be reached at (703) 308-3829. The fax phone number for this Group is (703) 305-7718.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Stefan Staicovici, PhD

AU 1732 9/30/02

SS

September 30, 2002